# ISESER 2019

# INTERNATIONAL SYMPOSIUM FOR ENVIRONMENTAL SCIENCE AND ENGINEERING RESEARCH

# PROCEEDING BOOK

*Konya Technical University*
*Environmental Engineering Dept.*

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# O 140. CHLORIDE ADSORPTION BY THE ADSORBENT SYNTHESIZED FROM WASTE PAPER

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**ABSTRACT:** In the production of recycled paper, two main problems of recycled product are whiteness and strength. For this reason, the most common approach is producing cartoon and cardboard. However, some waste papers are no longer convenient for recycled paper or cardboard production. Available environmentally friendly second- or third- generation solutions are needed for those types of waste papers. In this case the most common approach is incineration for energy production, which is the unfeasible one-time benefit, that does not allow keeping the material remain in the system. Chloride ($Cl^-$) is an anion that result in salty taste, salinity and abrasion in water and when excessive in soil, that cause reduced productivity of culture plants. In order to protect drinking water resources, the system should be prevented from excess $Cl^-$ entry. One of the $Cl^-$ removal methods from aqueous media is adsorption/ion exchange. Therefore, in this study an adsorbent was synthesized from wastepaper, and effectiveness of this adsorbent in $Cl^-$ adsorption was investigated. Firstly, slurry was obtained from shredded wastepaper, then citric acid activation was applied, rinsed, dried and ground to obtain fibrous adsorbent. NaCl solution was used in $Cl^-$ adsorption. In batch adsorption studies, first, optimum pH was determined as 7.8 at which the highest $Cl^-$ adsorption was achieved. Then, varying dosages of adsorbent were added to the reactors containing $Cl^-$ solution of the same initial $Cl^-$ concentration. The reactors were operated in a shaker at 220 rpm and at room temperature. Samples were withdrawn from the batch reactors at different time intervals and $Cl^-$ concentration of the samples was analyzed via Mohr titrimetric method. The sampling was performed until remaining $Cl^-$ concentration become constant, which was recorded as equilibrium time. The results indicated that at 2 g/L adsorbent dosage, in 120 minutes about 70% $Cl^-$ removal can be achieved. Isotherm analysis indicated that, the system fits Freundlich isotherm with the model of $q=0.016*Ce^{1.74}$ this indicates that the adsorbent surface is heterogeneous, and adsorption is multilayer through physical forces. The maximum $Cl^-$ adsorption capacity was found as 500±16 mg/g. This study resulted in two benefits: one is the recovery of a new generation material from a waste, and the second one is the suggested new alternative solution for $Cl^-$ removal from aqueous solution. As the paper adsorbent is in fibrous form, it is recommended that the effectiveness of this material, when mixed with soil, in reducing its salinity should be studied.

*Keywords: Adsorption, chloride ($Cl^-$) removal, wastepaper*